State of Alaska
Department of Fish and Game
Nomination for Waters
Important to Anadromous Fish

AWC Volume SE SC SW W AR IN USGS Quad Yakutat C-5 Quad

Anadromous Water Catalog Number of Tributary To Waterway 182-80-10100-2005-3022

Name of Waterway Ophir Creek (East Branch) USGS name ___ Local name ___

Addition ✓ Deletion ___ Correction ___ Backup Information ___

For Office Use

Nomination # 96 042	Lana Flanders 11-5-96 Regional Supervisor Date
Revision Year: 96	Dean W. Hughes 2/6/96
Revision to: Atlas ___ Catalog ___ Both X	Z. Frome 3/29/96
Revision Code: A-1	Drafted Date

OBSERVATION INFORMATION

Species	Date(s) Observed	Spawning	Rearing	Migration	Anadromous
Dolly Vardan	April 13 - June 16	NO	yes	yes	yes
Sockeye	April 13 - Nov.	yes	yes	yes	yes
Coho	April 13 - Nov.	yes	yes	yes	yes

Provide any clarifying information, including number of fish observed, location of fish survey data, etc. Attach a copy of the fish survey data, if available. Attach a copy of a map showing location of mouth and upper points of each species, specific stream reaches identified for spawning or rearing, locations of barriers, such as falls.

Comments: - smolt Trapping observations from April 13 - June 16, 1995

Sockeye Fry = 80,726

Sockeye Smolt = 1,299

Coho Fry = 128,395

Coho parr = 7,862

coho smolt = 1,928

Dolly Varden = 52

Adult escapement 1995 (Oct 30)

Coho — Sockeye

228 — 32

ALASKA DEPT. OF FISH & GAME

DEC [illegible]

REGION II HABITAT AND RESTORATION DIVISION

Name of Observer (please print) William G. Lucey

Date: 5DEC95 Signature: William G. Lucey

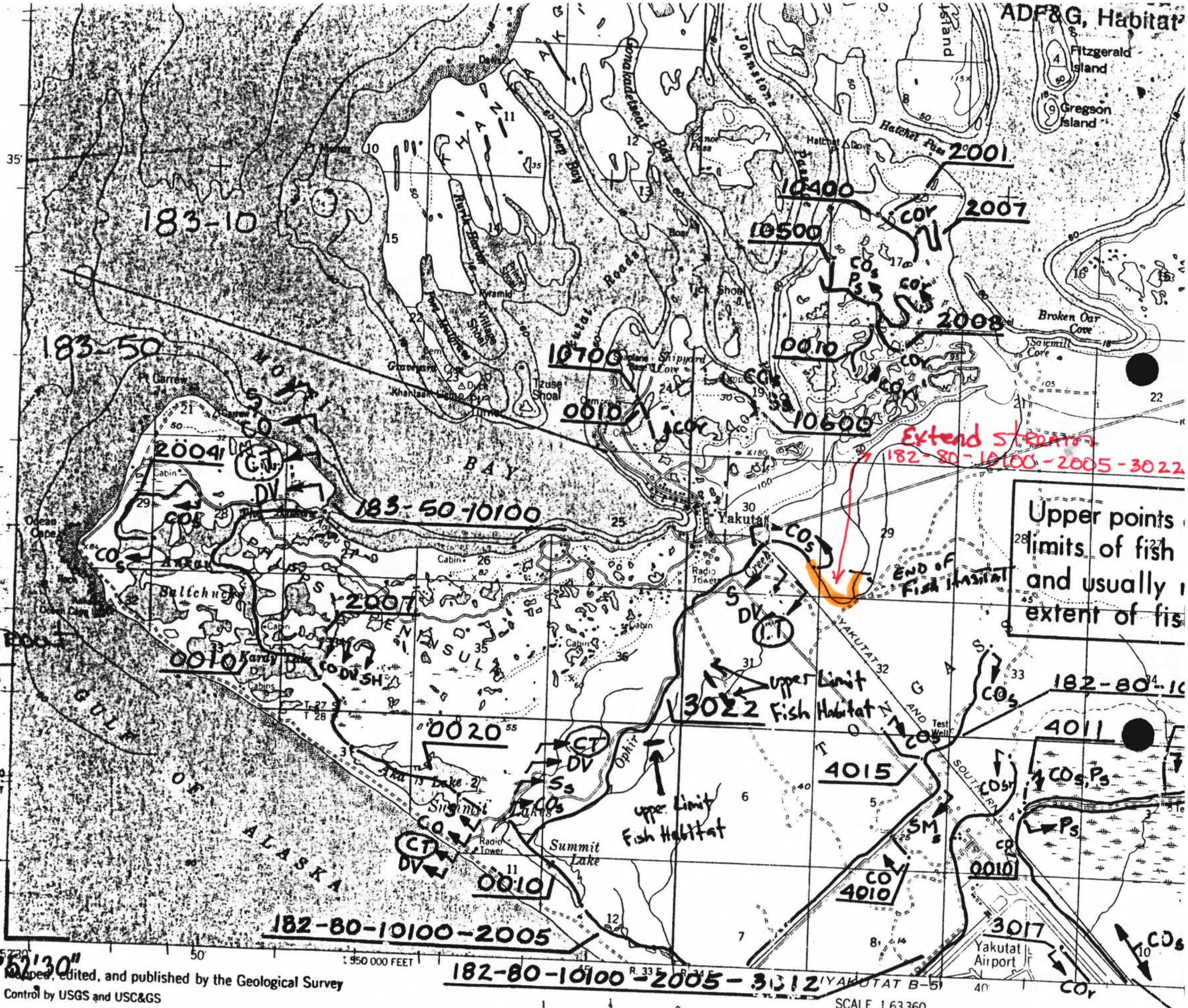
Address: Yakutat Ranger District - USDA Forest Service
Yakutat, AK 99689

Signature of Area Biologist: Phil Mooney

Rev. 12/91

Yakutat Quad C5

Change Legend for cutthroat Trout from C to CT



Mapped, edited, and published by the Geological Survey

Control by USGS and USC&GS

Topography by photogrammetric methods from aerial photographs taken 1948, field annotated 1959. Map not field checked

Selected hydrographic data compiled from USC&GS Charts 8455 (1952) and 8402 (1960) and from aerial photographs

This information is not intended for navigational purposes

Universal Transverse Mercator projection, 1927 North A...

CONTOUR INTERVAL 100 FEET

DOTTED LINES REPRESENT 50 FOOT CO...

Summer Coho Rearing Estimates For Summit Lake

Yakutat Ranger District
Tongass National Forest

by

William G. Lucey and Vince L. Harke
Biological Technicians
USDA Forest Service

August, 1995

Abstract

From August 10 to August 31, 1995 a Petersen mark recapture sampling effort was conducted on a 22,138 m2 section of Summit Lake. Juvenile coho abundance was estimated at 31,102 ($\pm$ 1706) age 1+ fish and 22,203 ($\pm$ 3338) age 0+ fish. A rearing density of 140 age 1+ coho per 100m2 and 100 age 0+ coho per 100m2 was determined. Assuming rearing density was similar for the entire lake system, a total population of 396,606 age 1+ and 283,290 age 0+ was calculated. Of the fish examined, 31 had caudal tattoos from a previous marking effort at the Ophir Creek smolt trap, April 20 - June 16, 1995. Marked coho parr were released over 1km upstream from Summit Lake. These results indicate that some of the coho in Summit Lake had overwintered in Ophir Creek. The average fork length for tattooed fish was 77 mm compared to 57 mm for coho trapped and marked in Ophir Creek from April 16 to June 13, 1995.

Introduction

As part of the ongoing effort to restore fish habitat within the upper reaches of Ophir Creek, this study was conducted to quantify the relation between Ophir Creek, with its substantial spawning habitat, and what role Summit Lake provides as rearing habitat for coho. A mark recapture sampling effort was used to provide an estimate of coho summer rearing densities in Summit Lake; and to determine if coho originating from Ophir Creek utilize Summit Lake as rearing habitat.

Methods

Trapping:

Trapping began at the mouth of Ophir Creek where it empties into Summit lake. Each day, 50 standard, wire minnow traps were baited using salmon roe and spaced ten to fifteen feet apart across the entire section. The area sampled was flagged to delineate separate trapping sections. Traps were set overnight, pulled the following morning, rebaited and reset in the next section. Hours of trapping effort were recorded from the time of placement to the time the traps were pulled. During the initial trapping period 7 sections were identified and trapped The same sections were retrapped during the second week of sampling to locate marked fish, from which population estimates could be obtained using the Peterson/Chapman models. During the second phase, trapping effort was increased to 8 days in order to place the traps at a higher density. All coho, sockeye and Dolly Varden were removed from the traps, placed in live wells and transported to live pens at the work station.

Marking:

All fish were anesthetized using Tricaine Methanesulfonate (MS-222) to allow for close examination and easy marking. During the initial trapping period all fish were marked using an upper caudal fin clip. Any recaptures from adjoining sections were noted and removed from the total catch numbers for the day.

All fish were examined for blue caudal tattoos received at the weir station earlier in the spring. A sample of 75 fork lengths were taken each day for coho 60 mm and over and 25 fork lengths were recorded for smaller fish. All coho under 60 mm were designated as age 0+, while fish over 60 mm were classified as age 1+. This procedure was repeated on each day of the sampling period.

Recapture.

During the second phase of the sampling, sections were retrapped and all fish were examined for upper caudal fin clips. The number of recaptures was recorded. All fish, both recaptures and new fish were given a lower caudal fin clip. As trapping continued in subsequent sections, fish containing both fin clips, or lower caudal clips, were recorded separately from the day's total catch.

Estimating population:

At the end of the sampling, all the catch data was entered into the following population estimate model created by Petersen:

$$N = M/n$$

Where N = population estimate, M = number marked and released, n = number of animals captured during the retrapping effort and m = number of marked fish recaptured.

In order to determine variance of the population estimate within 95% confidence intervals the following model devised by Chapman was utilized with the same factors as Petersen:

$$N = (M+1)\,(n+1)/(m+1) - 1$$

From this model Variance was determined by the following equation:

$$\text{Var.}(N) = (M+1)\,(n+1)\,(M-m)\,(n-m)/(m+1)2(m+2)$$

An approximate 95% confidence interval was determined by:

$$N \pm 2.00 \text{ sq.rt. } (\text{var.}(n))$$

These models were used under the following assumptions:

I - The population is closed to additions and permanent deletions

II - All fish are equally likely to be captured in each sample

III - Marks are not lost

These assumptions were met to the best extent by removing from the estimator, fish marked in separate sections and mortalities. Fin clips were permanent for the duration of the study (Ricker 1975).

Rearing Density:

Rearing density was determined by using the total number of fish captured in the area divided by the area in meters squared. Each trapping section was measured using a one hundred meter fiberglass tape. Areas in the channel were delineated by bank width, while those in the main body of the lake were defined by dense mats of vegetation which restricted fish movement. The area of Summit Lake was calculated using a 1:63,360 scale USGS map and a Modified Acre Grid. Under an assumption that rearing densities are similar for the entire lake, a population estimate for the lake was extrapolated from the rearing densities found in the study area.

Results

During the initial round of trapping, which continued for 7 days, each of the 50 traps was set for an average of 21 hours apiece. This translates to 1,050 hours of total trapping effort per day and 7,350 hours for the first round. The second round of trapping was increased to 8 days to better concentrate the recapture effort. The total hours for the second round was 8,400.

The contents of the traps showed that sticklebacks were the most abundant fish captured, coho age 1+ were second in abundance, coho 0+ , Dolly Varden and sockeye were caught in decreasing order (Table 1.).

The section of lake area sampled was 22,203 m2, comprising 8% of the total Summit Lake area.

Table 1. Represents the total catch for both sampling phases of all fish.

Class	Number of fish captured and marked	Number of fish examined for marks	Number of fish recaptured	Total captured
Coho 1+	5,472	4,496	1,214	9,968
Coho 0+	1,585	1,924	147	3,509
Caudal tattoos observed	23	8	0	31
Sockeye	6	6	0	12
Dolly Varden	92	28	18	120

From the total catch the population was estimated, with a variance using 95% confidence intervals, utilizing the previously mentioned Petersen/ Chapman models.

Table 2. Population estimates for juvenile Coho in the trapping area.

Age Class	Population Estimate	Variance
Coho 1+	31,102	$\pm$ 1,706
Coho 0+	22,203	$\pm$ 3,338

These estimates were used to determine rearing densities of 140 coho 1+ per 100m2 and 100 coho 0 + per 100m2, or 240 total coho/100m2 in the sampled lake area. Assuming that rearing densities are similar for the entire lake, which was 283,290m2 in area, the total population was estimated at 396,606 age 1 + and 283,290 age 0 + coho salmon, or 679,896 coho combined.

Fork Length:

Table 3. Comparison of mean fork lengths between Summit Lake and Ophir Creek

Age Class	Summit Lake (sample size)	Ophir Creek (sample size)
Coho 1 +	84 mm (994)	57 mm (2,312)
Coho 0 +	53 mm (473)	38 mm (466)
Coho with caudal tattoos	77 mm (31)	57 mm (2,312)

Discussion

Of the two initial objectives, only the rearing density work for age 1+ coho, had a sufficient sample size to obtain a good population estimate within the confidence intervals (31,102 $\pm$ 1706 fish). Age 0+ coho were not as common in the traps , as there may have been trap bias towards capturing larger fish. Also, the traps were evenly distributed over the entire lake section, so the majority of the traps were set in open water and not on the edges where fry prefer to hide in edge vegetation. Due to the poor recapture numbers for coho age 0 +, a large variance ($\pm$ 3330) occurred so confidence in the estimate was much lower than age 1 + coho.

The other objective was to determine if juvenile coho, which originate from Ophir Creek, utilize Summit Lake for rearing. This was difficult to quantify due to the small sample of caudal tattooed fish captured. A total of 10,597 parr were marked, with a caudal tattoo, and released, from April 28 to June 16, 1995, during the spring smolt trapping project on Ophir Creek. One problem may have been mark retention as the majority of tattooed fish recognized had marks in the flesh of the caudal peduncle and the majority of the parr (10,597) marked at the spring trapping station received tattoos on the rays of the caudal fin with only a small incidence of marks placed on the caudal peduncle. From the 31 tattooed fish recaptured, the only conclusion that can be made is that a portion of the winter reared fish from Ophir Creek do spend time rearing in Summit Lake.

The overall population estimates for Summit Lake make the wide assumption that rearing densities are equal across the entire system. This assumption was not quantified and it is possible that due to the low water conditions and the large amount of aquatic macrophytes growing in the lake during the summer months, that not all of the seventy acres could support a rearing density of 240 fish per 100m2.

It is not possible to correlate the low numbers of sockeye captured with a population estimate as minnow trapping is not an effective method for capturing sockeye. Sockeye captured during the study were incidental as they are not attracted to roe bait.

The number of sticklebacks captured in the traps was too great to enumerate. It is evident that this species is by far the most abundant fish in the system. Competition between salmonids and sticklebacks may be a factor affecting rearing densities.

Fork length: Average mean fork lengths are summarized in Appendix A.

Though the recapture numbers for tattooed fish were low it is interesting to note the change in the average fork lengths from the population of parr marked at the Ophir Creek weir station and those captured in the Summit Lake traps. The average fork length was 57 mm for age 1+ coho during the spring months and 76.65 mm in Summit Lake. This would suggest an average growth of 19.65 from spring to summer. Again, low sample size indicates some skewing in these numbers, but this growth rate falls within similar rates found in southeast Alaska (Halupka 1993).

Conclusion

The population and rearing estimates for age 1+ coho, in Summit Lake, are statistically significant to the point where they can be used for further studies of the system and or management concerns. However estimates for age 0+ coho are not as reliable and should be noted with this in mind. The recapture of caudal tattooed coho age 1+ was significant only in the fact that it established that at least a portion of the coho overwintering in Ophir Creek descend into the lake during the summer months. Statistically, it is not reasonable to quantify this assumption.

For fork length comparisons it is possible to say that within in the sample size, the examined fish grew at a rate comparable with those found in similar stream reaches in southeast Alaska.

An effort should be made to further investigate both winter and summer rearing requirements in Summit Lake as restoration efforts continue upstream in Ophir Creek. The effects of the enhancement work could include a greater fry and parr survival rate among coho and sockeye salmon, therefore intensifying use of rearing habitat. Knowing that at least some of the fish in Ophir Creek descend into the Summit Lake, Tawah system to complete growth before smolting, it is possible that increased competition could occur. It is not known whether the system could support a higher number of rearing salmonids.

Recommendations

A survey of winter limnological parameters would be useful for understanding the winter rearing capacity of Summit lake.

A winter survey should be conducted over ice to establish a more accurate measure of lake area.

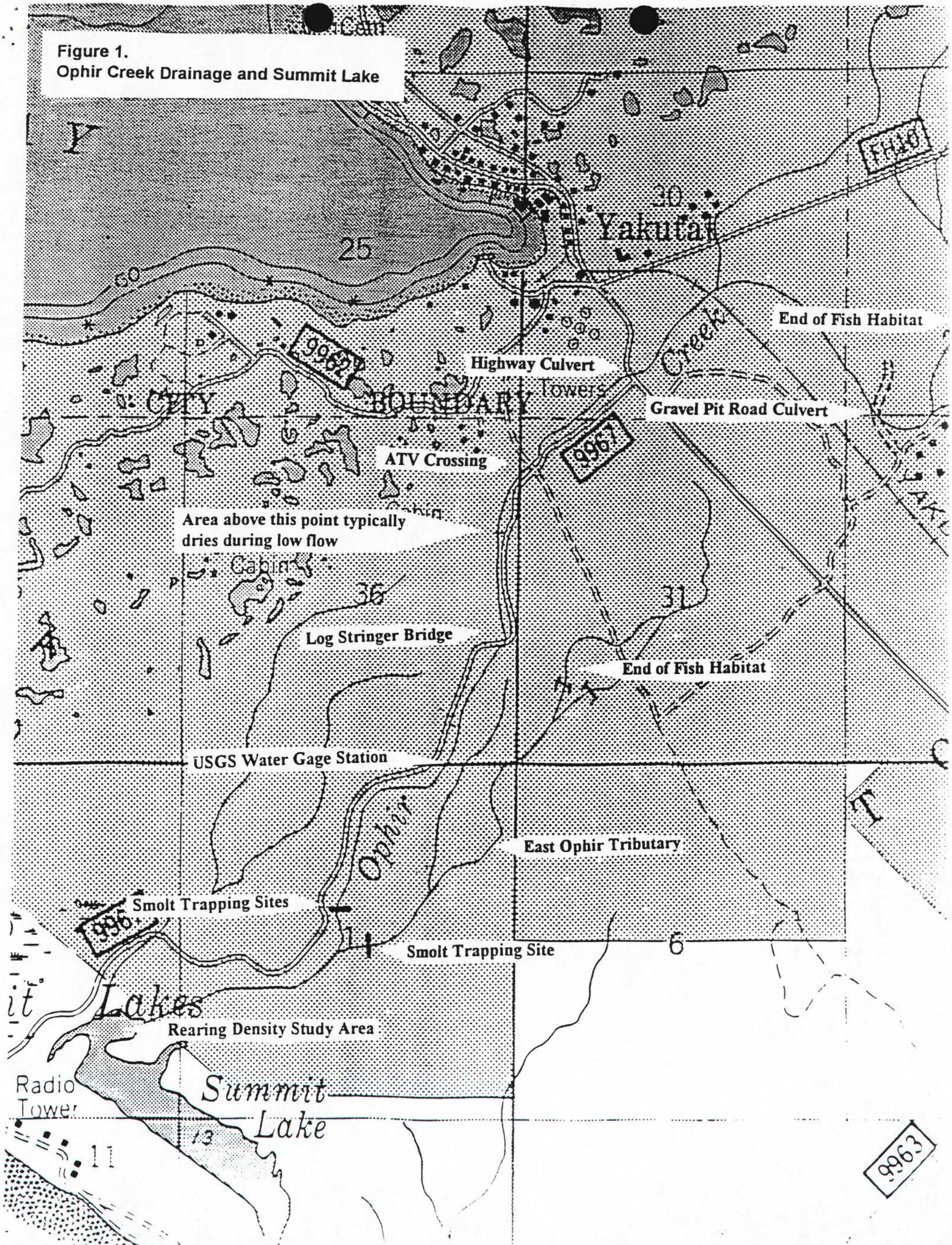
Limited winter trapping could be useful in locating winter rearing fish, from which examinations could be made of the limnological parameters associated with the location of these fish.

Literature Cited

Halupka, K.C; J.K. Troyer, M.F. Willison, F.H. Everest (1993): Identification of Unique and Sensitive Salmon Stocks of Southeast Alaska. Forestry Sciences Laboratory, Pacific Northwest Research Station USDA. Juneau, Alaska. Pages 1-42

Ricker, W.E. (1975): Computation and Interpretation of Biological Statistics of Fish Populations. Bulletin of the Fisheries Research Board of Canada. Department of the Environment, Fisheries and Marine Service. Ottawa, Canada. Pages 75-79

Figure 1.
Ophir Creek Drainage and Summit Lake



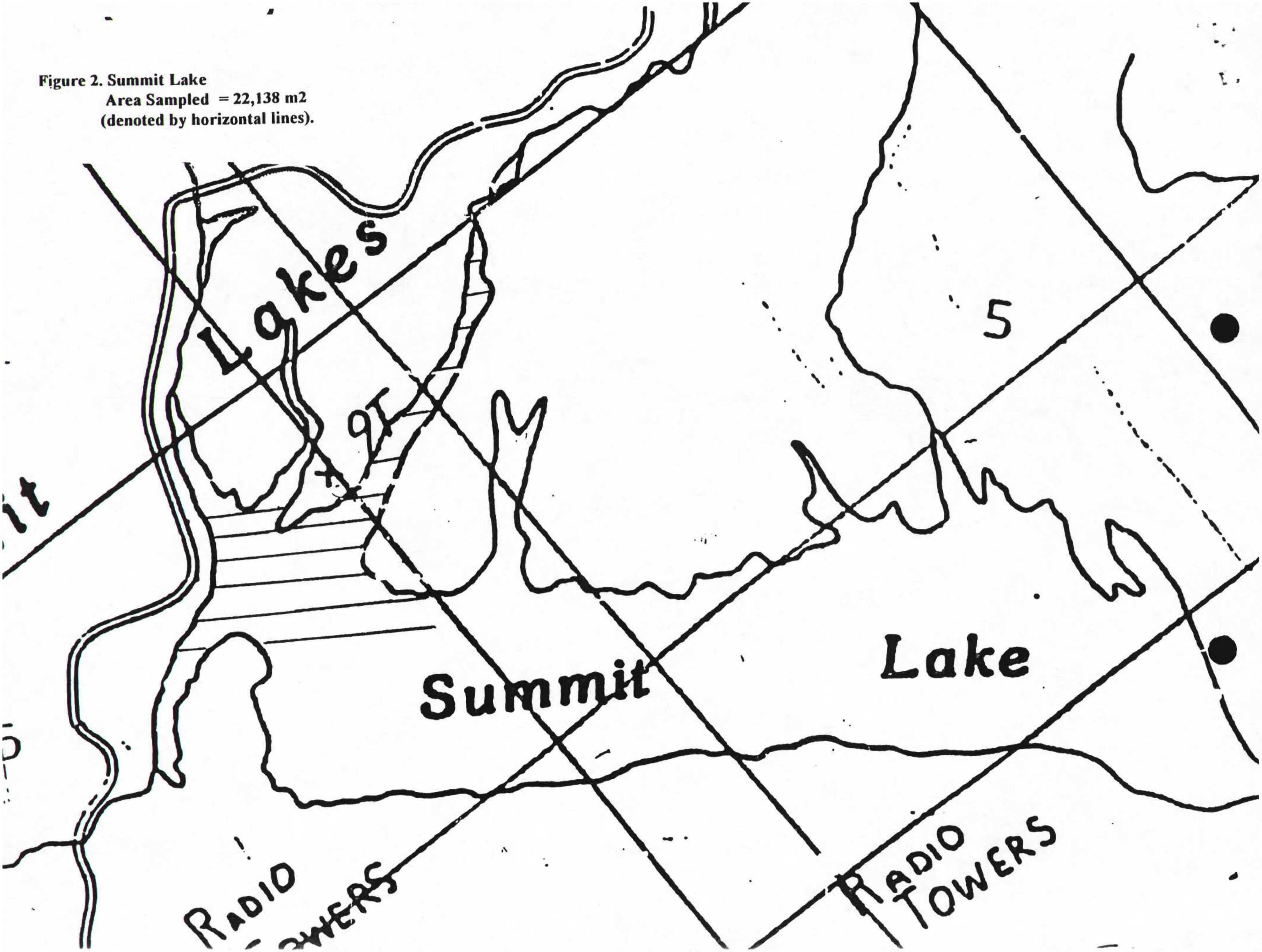
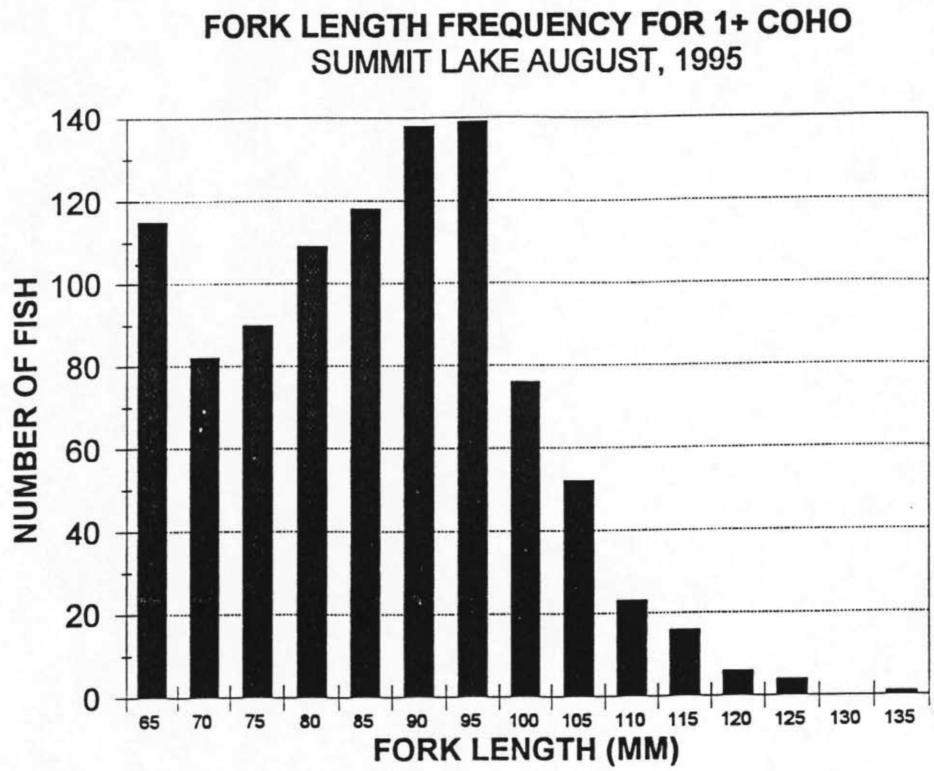
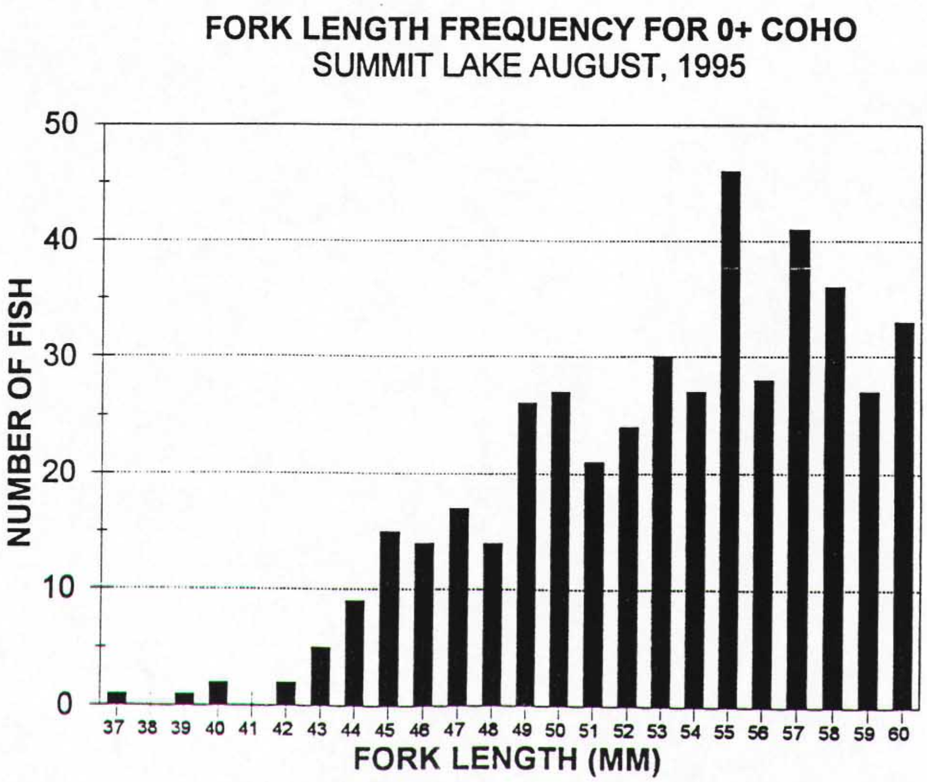


Figure 2. Summit Lake
Area Sampled = 22,138 m2
(denoted by horizontal lines).

Appendix A:



FORK LENGTH FREQUENCY FOR 1+ COHO
SUMMIT LAKE AUGUST, 1995
NUMBER OF FISH
0
20
40
60
80
100
120
140
65 70 75 80 85 90 95 100 105 110 115 120 125 130 135
FORK LENGTH (MM)



FORK LENGTH FREQUENCY FOR 0+ COHO
SUMMIT LAKE AUGUST, 1995
NUMBER OF FISH
0
10
20
30
40
50
37 38 39 40 41 42 43 44 45 46 47 48 49 50 51 52 53 54 55 56 57 58 59 60
FORK LENGTH (MM)

DOWNSTREAM MIGRATION OF JUVENILE SALMONIDS IN OPHIR CREEK, 1995

Vince L. Harke and William G. Lucey
USDA Forest Service, Tongass National Forest, Yakutat Ranger District

Objectives and Rationale

Ophir Creek provides spawning and rearing habitat for salmon, and is an integral part of the sport, commercial, and subsistence fisheries of the Yakutat area. In recent years, fish habitat in the Ophir Creek watershed has declined from historic levels. Natural processes such as eutrophication and changes in groundwater runoff have contributed to this decline, resulting in reduced waterflow. During low-flow periods in summer and winter months, much of the upper Ophir Creek watershed will go dry, resulting in mass mortality of salmon eggs and fry in these areas. Ophir Creek has now become the focus of a multi-agency watershed restoration effort. The primary objective of the restoration effort is to restore and maintain perennial waterflow in Ophir Creek.

Monitoring salmon smolt yield from Ophir Creek can provide a direct measure of stream productivity. The objective of this study was to determine the present salmonid production and smolt yield from Ophir Creek prior to any major watershed restoration activities; and to evaluate the importance of Ophir Creek as a winter rearing habitat for juvenile salmonids.

Summary of Results

Over 1,000,000 juvenile salmonids were counted at weirs on Ophir Creek, and East Ophir Creek from April 12 through June 16, 1995 to evaluate smolt yield and winter habitat. Over 97% of the fish counted were sockeye and coho fry. The total count for both weir sites combined was 3,979 sockeye smolt, 3,932 coho smolt, 16,279 coho parr, 331 dolly varden, and 4 steelhead smolt. These results indicate a yield of 19.1 fish/100m2 for parr and smolt in main Ophir Creek. Trapping results indicate that the East Ophir tributary stream is an important spawning and rearing area, producing 45% of the total parr and smolt counted, and 21% of the fry counted. The yield of smolt and parr from East Ophir Creek was 43.8 fish/100m2. Fish habitat survey results indicate that over half of the potential rearing habitat in main Ophir Creek was dry during the summer months of 1994, or frozen during the winter months of 1994/95. East Ophir Creek is lower in elevation, and did not dry up during this period. The smolt trapping results indicate a dramatic difference in the smolt yield between Ophir Creek and East Ophir Creek. These results indicate smolt yield from Ophir Creek may be significantly altered by these low water events.

Methods

A V-Shaped weir was constructed across Ophir Creek approximately 50 meters upstream from its confluence with the East Ophir Creek tributary (Figure 1). Two fyke nets, each 1m2 x 3m long were fished from the apex of the weir from April 12, through June 16, 1995. The weir was constructed of 6 mm2 mesh vexar screen supported by lumber and steel pipe pounded into the streambed. Each fyke net was connected to an anchored live box by a 10 cm diameter pipe. A second weir was constructed on the East Ophir Creek tributary approximately 50 meters upstream from its confluence with main Ophir Creek. A single fyke net/live box of the same dimensions was fished at this site. Fyke nets were fished 24 hours a day for the entire trapping period.

Parr, smolt and fry of all species were counted every day. A sample of up to 100 parr and smolt were measured for forklength daily, and a sample of up to 100 fry were measured for forklength weekly. Scale samples were collected to determine age composition from up to 30 sockeye and coho smolts each week.

Fry were enumerated by weight estimation daily. Each day a sample of fry was collected, sorted by species, weighed and counted to determine average fry weight and the percentage of coho or sockeye fry. Check counts were made every week to test the accuracy of the weight estimation.

Body size and external characteristics were used to identify species and separate fry, parr, and smolt. For coho, it was sometimes difficult to separate large fry from small parr, and large parr from small smolt, so forklength was used to distinguish between fry, parr, and smolt. For coho, fry were 30mm-45mm, parr:45-70mm, and smolt:70+mm forklength.

To test trap efficiency, a sample of coho smolt and sockeye smolt were marked with a caudal tattoo and released 50-100 meters upstream from the trap sites. A different mark was used for each release. To determine trap efficiency, the percent of marked fish recaptured at the weirs was used as an estimate of trap efficiency.

A Panjet Needleless Injector and Alcian Blue dye were used to mark smolts and coho parr with a caudal tattoo. Coho parr were marked to determine the distribution of parr within lower Ophir Creek and Summit Lake. (The results of the coho parr distribution and rearing density in Summit Lake are reported in a separate document).

Water temperature was recorded daily with a thermometer and stream stage was recorded daily with a staff gauge. Total rearing area was determined from a comprehensive stream habitat survey of Ophir Creek and East Ophir Creek upstream from the trap sites. In this survey, the stream was divided into individual habitat units, typically pools, riffles, and glides. Each unit is measured for length and average channel width to determine area. Other data, including substrate composition, available spawning area, pieces of large woody debris, and riparian vegetation was recorded for each unit. (The results from this survey are reported in a separate document).

Results

Over 1,000,000 juvenile salmonids were captured at the Ophir Creek trap sites. Of these , more than 97% were coho and sockeye fry. Sockeye fry comprised 60% of the fry captured at the trap sites. Other salmonids captured at the site include coho parr and smolt, sockeye smolts, dolly varden and steelhead. Steelhead were least abundant with only 4 smolt captured. Coho parr were the most abundant with a total count of 16,279 parr. Sockeye and coho smolt counts were nearly identical, with 3,979 sockeye (51%), and 3,932 coho (49%). The East Ophir Creek tributary is a significant spawning and rearing area, producing 45% of the total parr and smolt counted, and 21% of the fry counted at the weir sites (Table 1).

Trap efficiency tests varied over the course of the sampling period. At the Ophir Creek weir, both coho and sockeye smolts were marked and released above the weir site on three occasions. A total of 90 out of 121 (74%) coho smolts marked and released were recaptured. Recapture rates for coho smolt varied from 100% to 43% depending on the mark used. In East Ophir Creek, 49 out of 50 (98%) coho smolts marked were recaptured at the weir. Recapture rates for sockeye smolts were lower than for coho. Only 43 of 86 (50%) sockeye smolts marked were recaptured at the Ophir Creek weir. Recapture rates for sockeye smolts varied 79% to 24% depending on the mark used. In East Ophir, 21 of 29 (72%) marked sockeye smolts were recaptured. Several factors may have affected these trap efficiency results, including predation and mark recognition. If the trap efficiency calculated for coho and sockeye is applied to the actual counts the estimate of smolt yield for Ophir Creek is increased significantly (Tables 2,3).

Based on the number of fish captured, and the estimated rearing area of Ophir Creek (68,515m2), the total yield for sockeye smolts and coho parr & smolts was 19.1 fish/100m2. Coho parr and smolts accounted for 80% of the actual total yield, with coho parr comprising 80% of the coho yield. When the expanded number of smolts based on trap efficiency is calculated the total yield becomes 28.3 fish/100m2. Based on the estimated rearing area of East Ophir Creek (25,320m2), the actual total yield for this stream was 43.8 fish/100m2. When the expanded number based on trap efficiency is calculated the expanded estimated becomes 46.4 fish/100m2 (Tables 4,5).

Migration timing varied between species and life stages. Smolt migration was consistent with relatively low numbers of fish counted daily for the entire period. The peak migration period for all fish except coho and sockeye fry occurred May 27 through May 31, with 35% of the sockeye smolt, 54% of coho smolt, and 30% of the coho parr counted during these five days. Coho parr migration peaked in mid April, then again in late May. Coho smolt followed a similar pattern. Many coho smolt were counted in mid to late April, followed by a three week period between April 28 to May 19 in which only seven coho smolt were counted. This was a relatively dry period, with little precipitation. Sockeye fry counts fluctuated greatly over the entire period with peaks occurring in April, May and June. Coho fry were not as abundant as sockeye fry until early June, with peak counts for both sockeye and coho occurring on June 8, following a major rain event (Figures 2,3,4,5,6,7).

The weekly average forklengths for fry, parr, and smolts were consistent throughout the study, with minor fluctuations from week to week. Sockeye fry steadily increased in length from a mean of 31mm to 34mm. Sockeye smolts increased in size from a mean of 57mm to 64mm forklength during the first seven weeks, until after the peak migration in late May, when mean forklength decreased to 60mm. Coho smolt size decreased from a mean of 102mm to 84mm after the first week of the study, and varied from week to week from a mean of 92mm in early May to 79mm in mid June. The mean length for coho fry was 38mm for the entire period while the weekly mean length varied from a low of 35mm in late May to a high of 40mm in early June. Many large coho fry (40mm-45mm) were observed each week of the study (Figures 8,9,10,11,12).

Scale samples were examined from at total of 220 coho and 162 sockeye for age analysis (Farrington, 1995). This sample size is not large enough to calculate an accurate age composition structure for the Ophir Creek smolts. However, when the length frequency data is compared with the aged samples, these results indicate that 95% of coho and sockeye smolts from Ophir Creek were age-1 smolts. All coho parr, and all sockeye less than 65mm forklength were age 1 (Tables 5,6) (Figures 13,14,15,16,17).

Water temperature increased from 3° to 7° celsius during the study (Figure 18). Stream flow varied from a low of 7 cubic feet per second (cfs) to high of 25 cfs (Sykes, 1995) (Figure 19). Stream flow fluctuated with rain events, and was affected by snow melt runoff (Figures 20, 21). The main peak of the smolt and parr migration corresponded with a major rain event and sharp increase in stream flow in late May. Fry migration peaked in June, also corresponding with a major rain event and increase in streamflow (Figure 22). Daily fry counts for both sockeye and coho fry increased significantly in June, and may have corresponded with increasing water temperatures.

Other fish species captured at the weirs included hooligan, threespine stickleback, and slimy sculpin. Hooligan were present only from April 12 through April 26. A total of 152 hooligan were counted at the main Ophir Creek weir. These fish had spawned above the weir site prior to the weir installation on April 11, and were captured on their downstream migration. An adult sockeye was also captured migrating downstream on May 2. Apparently this fish had moved upstream with the hooligan prior to April 11. An adult steelhead was seen at the weir on April 29. This was the only adult steelhead seen at the weir site. Sculpin were captured throughout the entire study period, with a total count of 2,618 sculpin (Figure 23). Sticklebacks were less abundant, with only 340 counted (Figure 24).

Discussion

The expanded estimate of juveniles based on trap efficiency probably overestimates the actual number of fish that migrated from Ophir Creek. The actual counts recorded are the best estimates of the downstream migration. The weirs that were constructed on Ophir and East Ophir Creek were designed to block the entire stream channel. It would have been difficult for a fish moving downstream to avoid the fyke nets. Some marked coho parr were able to migrate upstream through the weir and were subsequently recaptured in the fyke nets. These fish obviously found small gaps along the bottom or the edges of the weir, but it would be easier for a fish moving upstream to locate these gaps than for a fish moving downstream.

Mark recognition and predation are two factors that affected the trap efficiency tests. Mink were observed around the traps on several occasions. The mink learned to enter the traps through the fyke nets and, on one occasion, chewed holes through the screening on one of the holding boxes. Precautions to control the mink predation were taken after this event, but this predation almost certainly affected the efficiency tests. Mark recognition may have affected the test as well. The dorsal fin tattoo mark had the lowest recapture rates for both sockeye and coho. This was a difficult mark to see, so many of these fish may have been recaptured but were not recognized as marked fish.

The results of the Ophir Creek study are comparable to those documented for the Old Situk River. Both the Old Situk and Ophir Creek share similar stream characteristics. These are low gradient, groundwater stream systems, with similar habitat features. The total yield of salmonids from Ophir Creek is identical to that observed for the Old Situk. The actual salmonid yield for the Old Situk River was calculated at 19 fish/100m2. The actual yield for Ophir Creek was 19.1 fish/100m2. The expanded estimate for the Old Situk was 45.3 fish/100m2. This compares to the actual yield of 43.8 fish/100m2 calculated for East Ophir Creek (Thedinga et al, 1991).

The age composition and mean size of smolts from Ophir Creek is nearly identical to that observed for the Old Situk. In Ophir Creek, 95% of coho smolts were age 1 fish. This is identical to that observed in the Old Situk. For sockeye smolts, 97% were age 1 in Ophir Creek, whereas in Old Situk, 99% of sockeye were age 1. The mean size for sockeye smolts (62mm) in Ophir Creek is identical to the sockeye smolt size documented for the Old Situk (Thedinga et al, 1991). Very few sockeye systems in southeast Alaska produce stream rearing smolts, but this variation of the sockeye life history has been documented in Taku and Stikine River tributaries, as well as the Old Situk River. Several rivers in the Yakutat area have been documented for producing age-0 sockeye smolt (East Alsek, Akwe, Ahrnklin, Situk Rivers) (Halupka et al 1993). These systems are probably producing river type smolts as well.

The high abundance of age 1 coho smolts (95%) in Ophir Creek is unusual when compared with other streams in southeast Alaska, where age 2 smolts are most abundant. The mean size of age 1 coho smolts in Ophir Creek (84mm) is similar to that observed for other streams in northern southeast Alaska (Auke Creek 87mm), (Yehring Creek 79mm). Although streams in southeast Alaska typically produce more age 2 coho smolts, several streams in the Yakutat region have been documented to produce predominantly age 1 smolts. The Tsiu, the Klukshu, and the Situk Rivers are all Yakutat area rivers that have been documented as producing predominantly age 1 coho smolts (Halupka et al, 1993) (Thedinga et al, 1993).

The results of this study clearly indicate that Ophir Creek provides important spawning habitat for both sockeye and coho salmon. Nearly a million sockeye and coho fry were counted at the two weir sites. Salmon spawning escapement counts in October and November of 1994 revealed a peak count of 4,935 sockeye and 6,123 coho upstream of the weir sites on Ophir and East Ophir Creek (Swanson, 1995). The large numbers of outmigrant fry and parr, and low number of smolt (relative to adult escapement) indicate that most fish that originate in Ophir Creek migrate out of Ophir Creek as fry or presmolts to utilize other rearing areas such as Summit Lake or Tawah Creek, but return as adult fish to spawn in Ophir Creek.

Fish habitat survey results indicate that over half of the potential fish spawning and rearing habitat (59% and 51% respectively) in main Ophir Creek was completely dry during the summer months of 1994, or frozen during the winter months of 1994/95. This dry area begins approximately 300 meters upstream of the log stringer bridge on the Coast Guard road and extends upstream to the upper limits of fish habitat above the gravel pit road. Salmon spawning escapement counts indicate that 80% of the coho, and 42% of the sockeye spawned in the affected area in 1994.

When the smolt yield data from Ophir Creek is compared with the data from East Ophir Creek, it appears that smolt yield from Ophir Creek may be significantly altered by low water events. The stream habitat in East Ophir Creek is nearly identical to habitats in Ophir Creek. Both streams have similar percentages of pool, glide, and slough type habitats, as well as similar densities of large woody debris. The main difference between the two streams is that East Ophir Creek is lower in elevation, and only a small section in the upper reach goes dry during low water events. Therefore, the majority of fish habitat is unaffected by drought. This may explain why the smolt yield for East Ophir Creek (43.8 fish/100m2) is twice as productive as the yield observed in Ophir Creek(19.1 fish/100m2).

Recommendations

Restoration activities in Ophir Creek should be designed recognizing the importance of Ophir Creek as a spawning and rearing stream for sockeye and coho salmon. The stream section between the Airport Highway crossing and the Gravel Pit Road is a critical spawning area for coho salmon. Nearly 60% of the coho, and 25% of the sockeye in Ophir Creek spawned in this section in 1994. Restoration excavations in this area should be designed to maintain or increase the available spawning habitat in this area.

The fish habitat survey data that was collected for Ophir Creek can be used to develop a design for habitat restoration. Ophir Creek is comprised of many diverse elements that create productive fish habitat. These elements include riparian vegetation, large woody debris, spawning gravels, and pool/glide habitats for rearing fish.

As restoration efforts in Ophir Creek continue, so should smolt/fry trapping be continued each year as a direct measure of fish productivity in Ophir Creek.

Adult salmon spawning escapement counts should be completed annually in Ophir Creek as well as other tributary streams to the Tawah Creek basin. This information can be used to determine the overall contribution of Ophir Creek to the Tawah Creek system.

East Ophir Creek should be used as a control stream to measure the effects of restoration efforts in Ophir Creek.

Table 1. Species and number of fish captured at the Ophir Creek and East Ophir Creek weirs, April 12 - June 16, 1995.

Species	Ophir Creek Count	East Ophir Count	Total Number
Coho Fry	273,121	128,395	401,516
Coho Parr	8,417	7,862	16,279
Coho Smolt	2,004	1,928	3,932
Sockeye Fry	503,110	80,726	583,836
Sockeye Smolt	2,680	1,299	3,979
Dolly Varden	279	52	331
Steelhead Smolt	4	0	4
Total =	789,615 (78%)	220,262 (22%)	1,009,877
Fry Mortalities:	7,586	4,147	11,733 (1.14%)

Table 2. Number of smolts marked and released above the Ophir Creek Weir April 12 - June 16, 1995.

Release Date	Number of Fish Marked		Mark	Number of Fish Recaptured		Trap Efficiency(%)	
	Coho	Sockeye		Coho	Sockeye	Coho	Sockeye
May 11	50	28	MCT	50	22	1.00	0.79
May 16	21	29	DT	9	14	0.43	0.48
May 28	50	29	UCT	31	7	0.62	0.24
Total	121	86		90	43	0.74	0.50

MCT = Mid Caudal Tattoo, UCT = Upper Caudal Tattoo, DT = Dorsal Tattoo

Table 3. Number of smolts marked and released above the East Ophir Creek Weir April 12 - June 16, 1995.

Release Date	Number of Fish Marked		Mark	Number of Fish Recaptured		Trap Efficiency(%)	
	Coho	Sockeye		Coho	Sockeye	Coho	Sockeye
May 16	50	29	CT	49	21	0.98	0.72

CT = Caudal Tattoo

Table 4. Yield of sockeye smolts, and coho smolts and parr for Ophir Creek, and the expanded estimate based on trap efficiency of 74% for coho, and 50% for sockeye. (The estimated area for Ophir Creek is 68,515m2).

Species	Actual Count		Expanded Estimate	
	Number of fish	Yield (no./100 m2)	Number of Fish	Yield (no./100m2)
Coho Smolt	2,004	2.9	2,708	3.9
Coho Parr	8,417	12.2	11,374	16.6
Sockeye Smolt	2,680	3.9	5,360	7.8
Total	13,101	19.1	19,442	28.3

Table 5. Yield of sockeye smolts, and coho smolts and parr for East Ophir Creek, and the expanded estimate based on trap efficiency of 98% for coho, and 74% for sockeye. (The estimated area for East Ophir Creek is 25,320m2).

Species	Actual Count		Expanded Estimate	
	Number of fish	Yield (no./100 m2)	Number of Fish	Yield (no./100m2)
Coho Smolt	1,928	7.6	1,967	7.7
Coho Parr	7,862	31.0	8,022	31.7
Sockeye Smolt	1,299	5.1	1,755	6.9
Total	11,089	43.8	11,744	46.4

Table 6. Age composition of coho and sockeye smolts juvenile salmonids caught at the Ophir Creek and East Ophir Creek weirs April 12- June 16, 1995.

Species	Number of Fish Aged	Age in Years(%) 1	2
Coho	220	94.6%	5.4%
Sockeye	162	96.9%	3.1%

Table 7. Mean length and age of fish captured at the Ophir Creek and the East Ophir Creek weirs, April 12 - June 16, 1995.

Species	Age (Years)	Fork Length (mm)	No. Sampled for Forklength
Coho fry	0	38	435
Coho parr	1	57	2,312
Coho smolt	1	83	1,211
Coho smolt	2	98	69
Sockeye fry	0	31	387
Sockeye smolt	1	62	1,487
Sockeye smolt	2	84	48

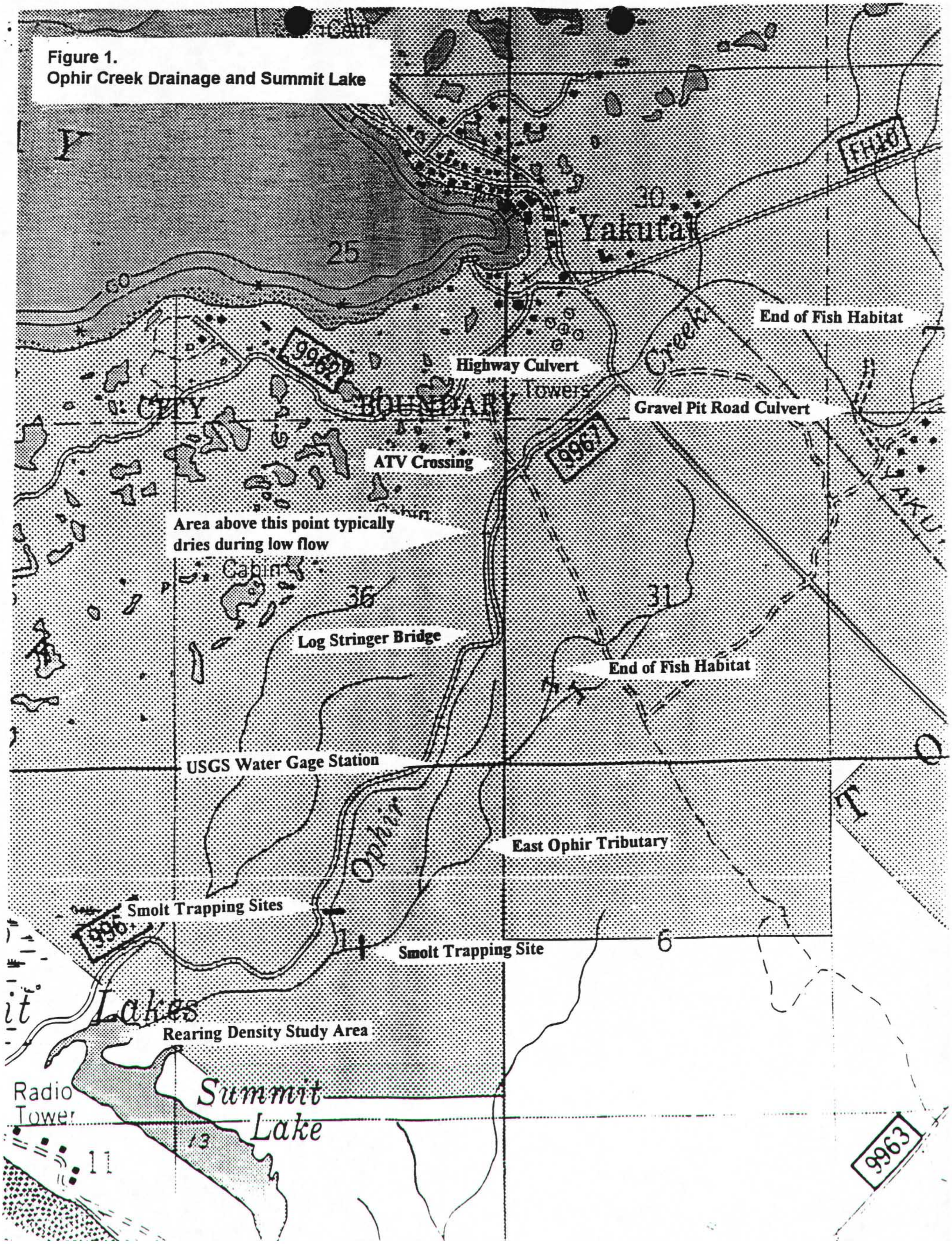
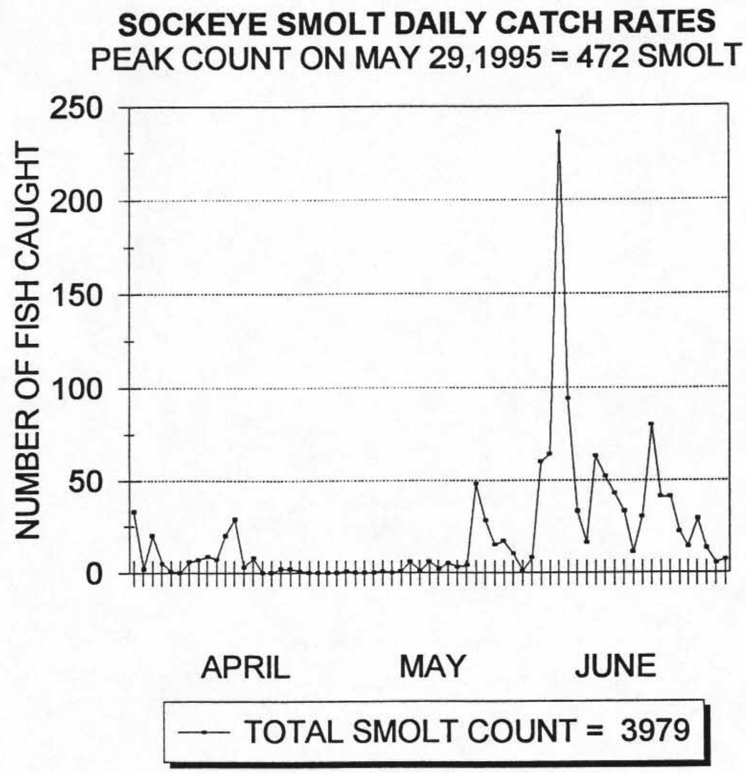


Figure 1.
Ophir Creek Drainage and Summit Lake
Yakutat
End of Fish Habitat
Highway Culvert
Gravel Pit Road Culvert
ATV Crossing
Area above this point typically dries during low flow
Log Stringer Bridge
End of Fish Habitat
USGS Water Gage Station
East Ophir Tributary
Smolt Trapping Sites
Smolt Trapping Site
Rearing Density Study Area
Summit Lake
Ophir
Creek
Radio Tower
Towers
Cabin
CITY BOUNDARY
9962
9967
9963
FH10



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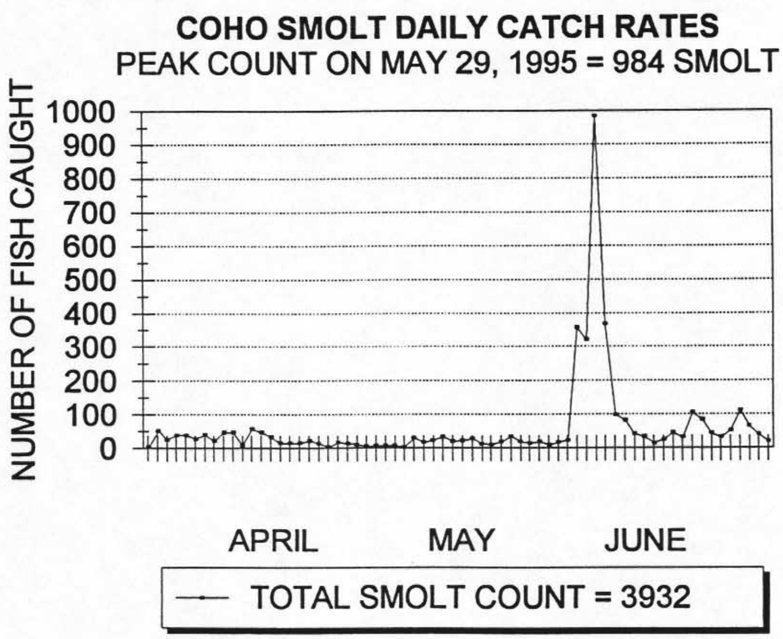
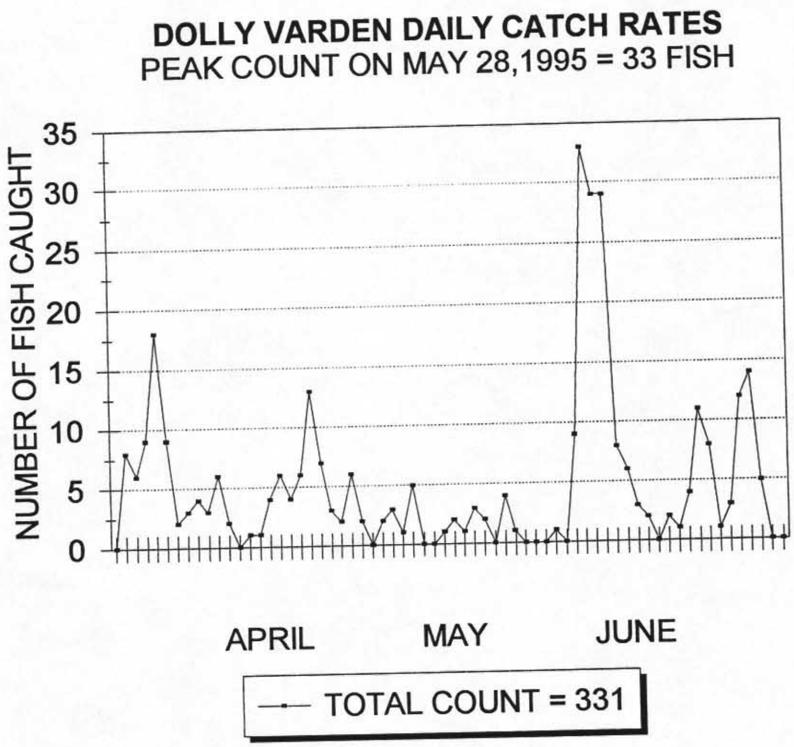


Figure 3.

Figure 4.



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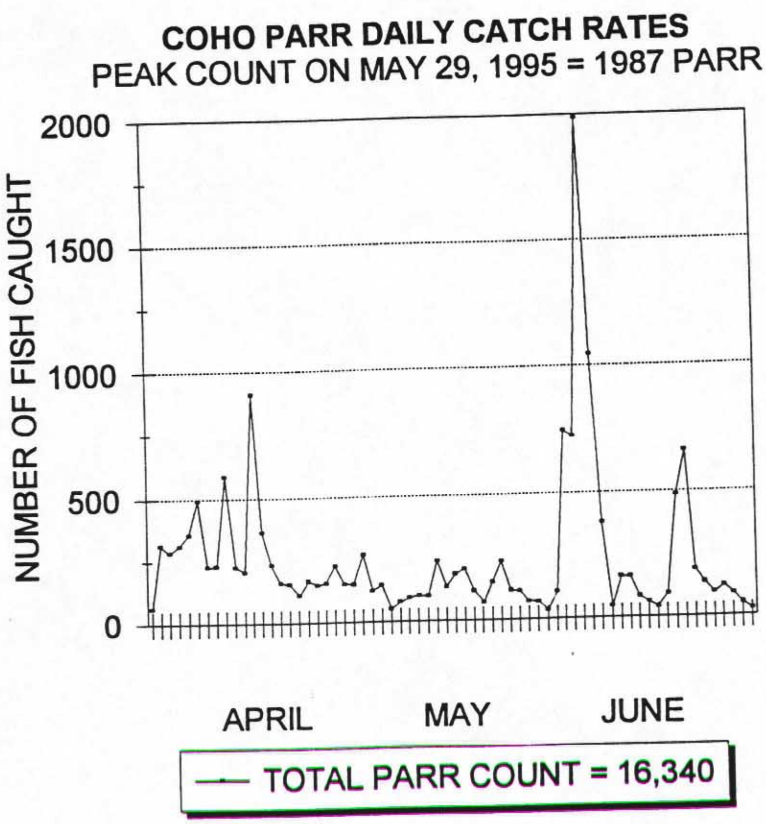

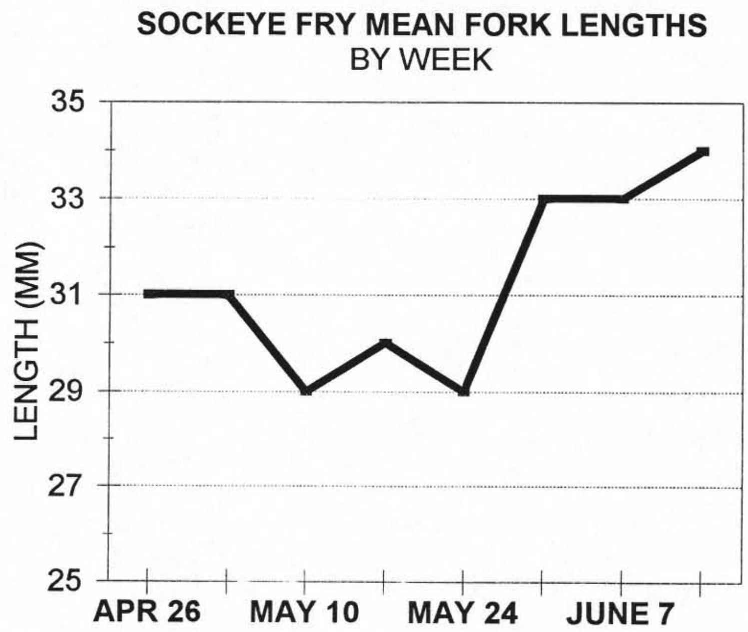

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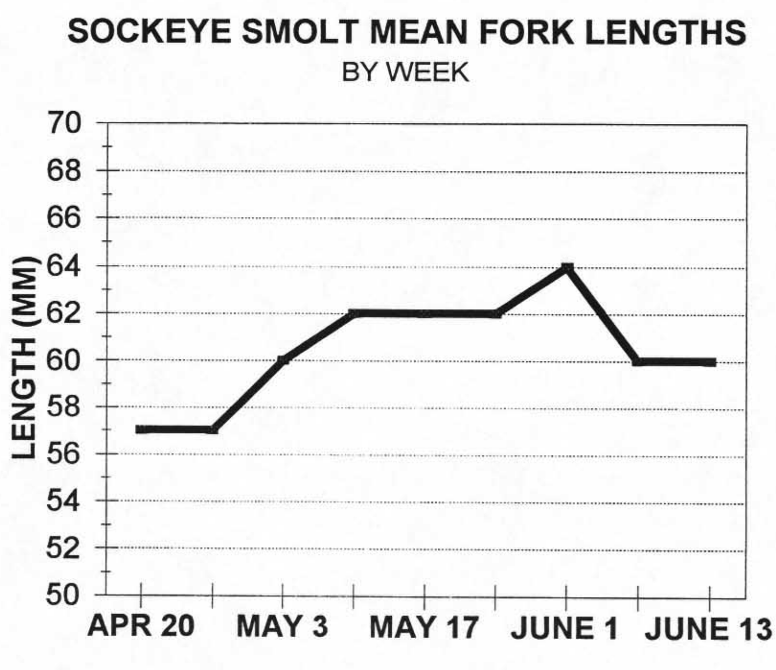

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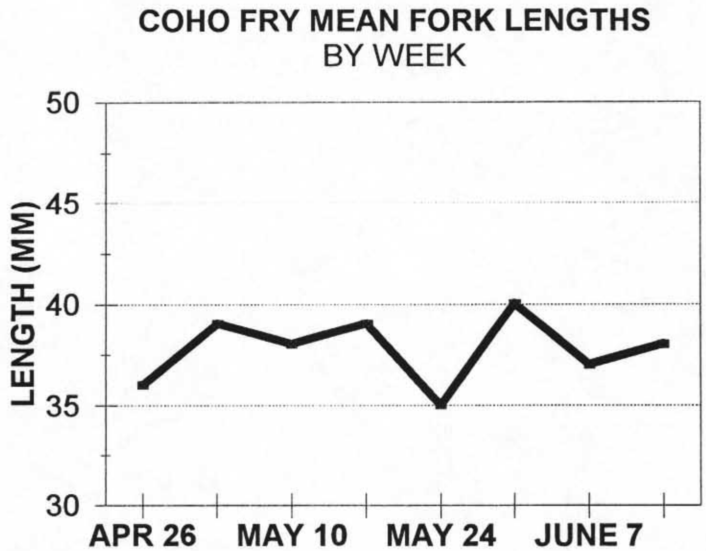
Figure 10.



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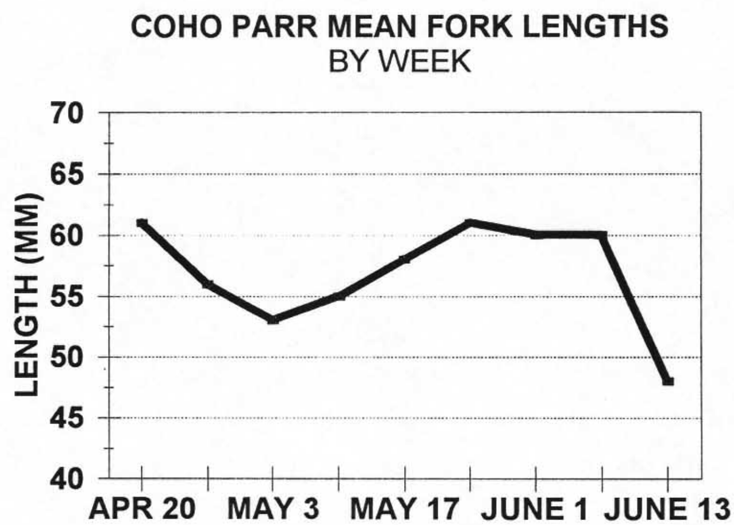

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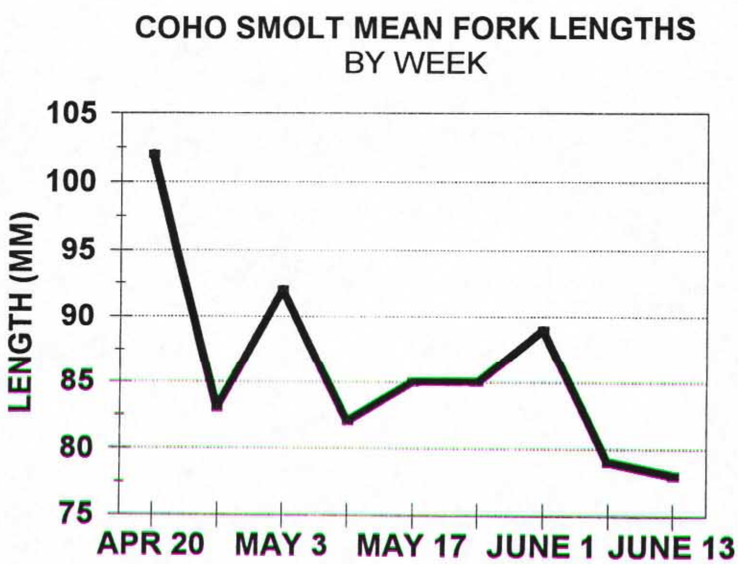

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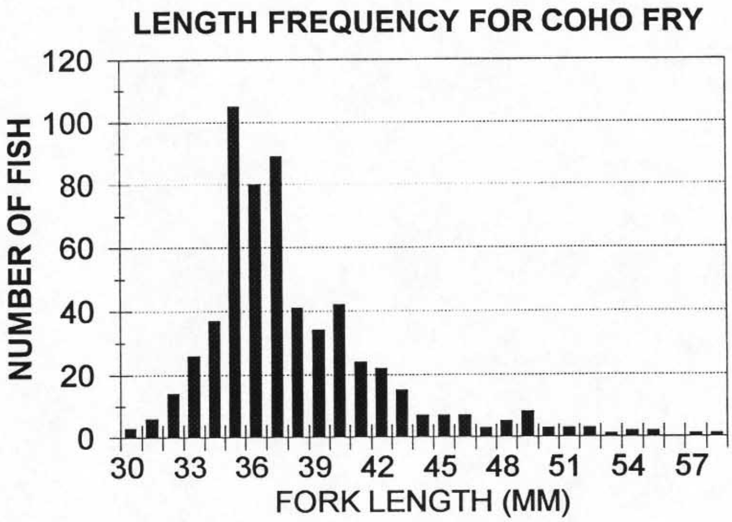

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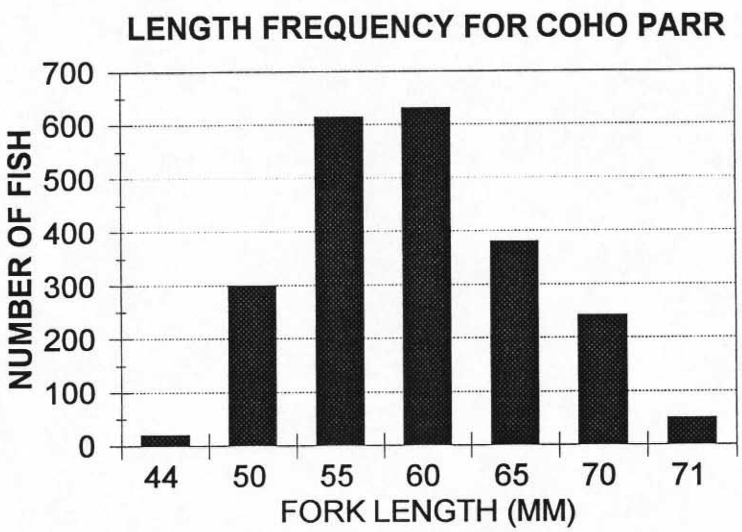

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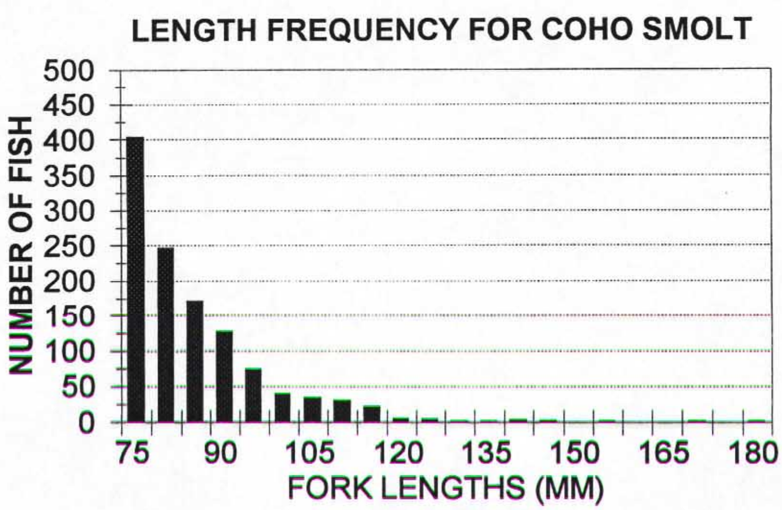

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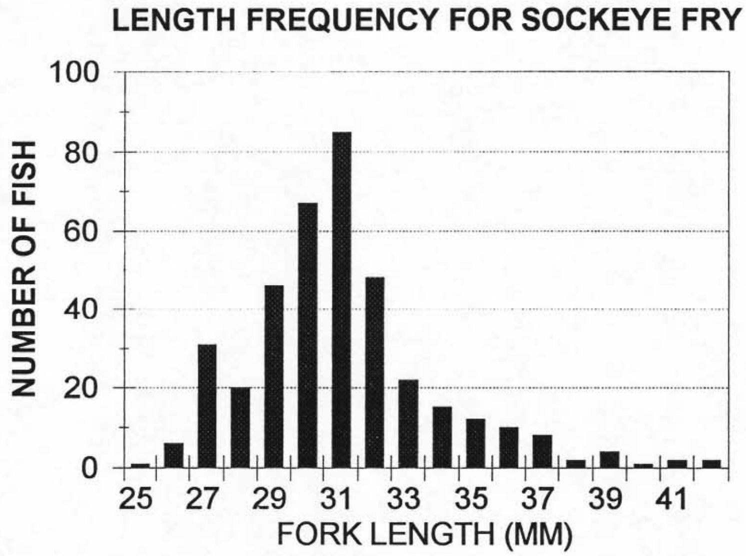

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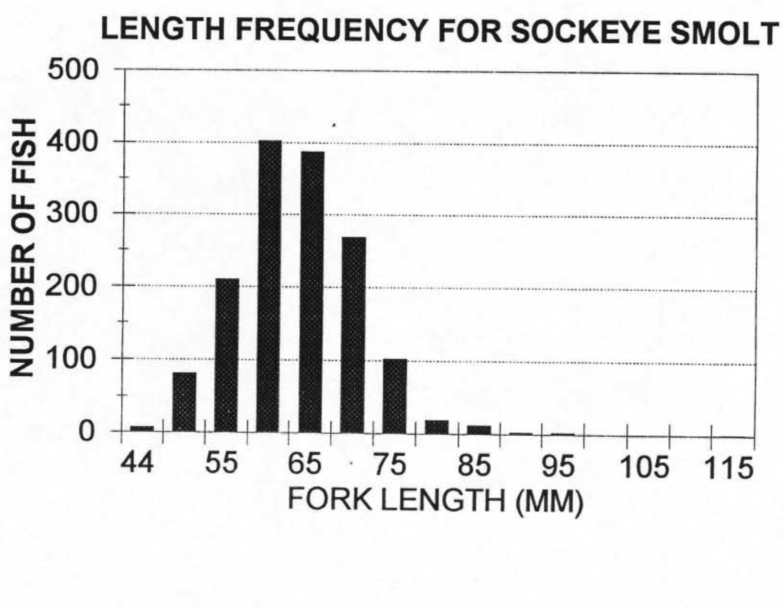

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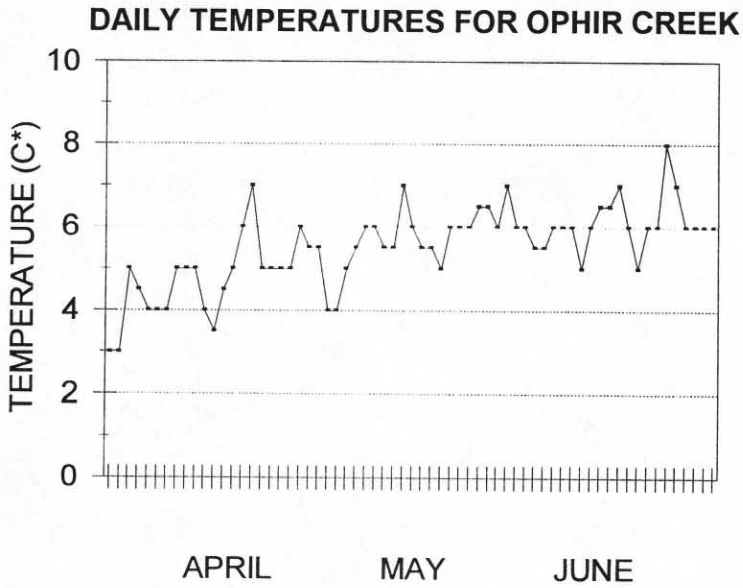

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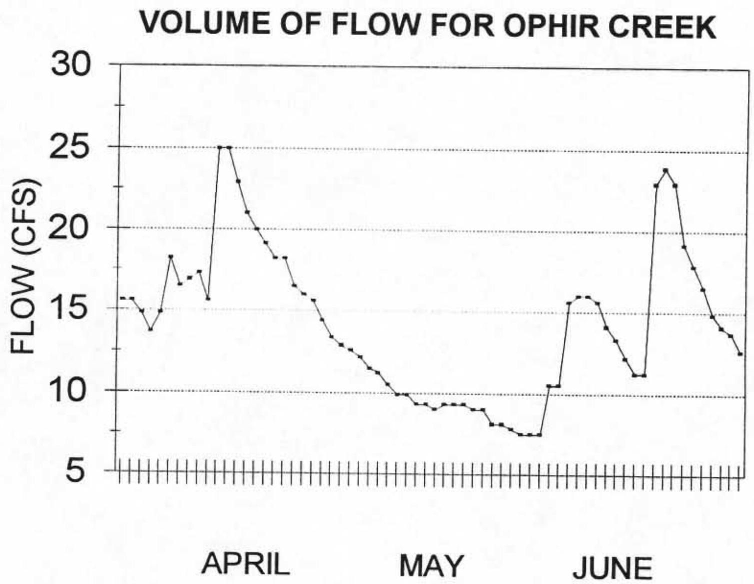

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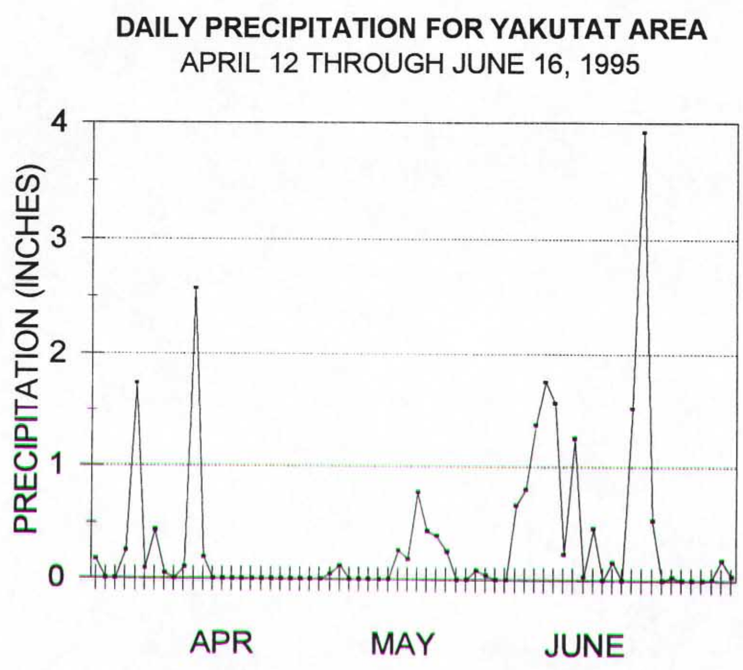

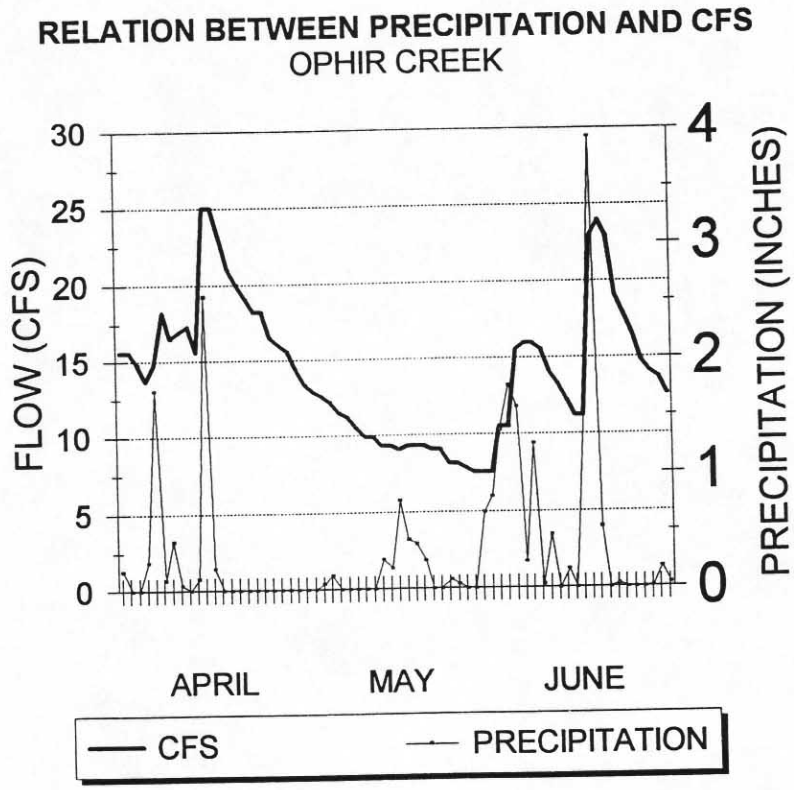

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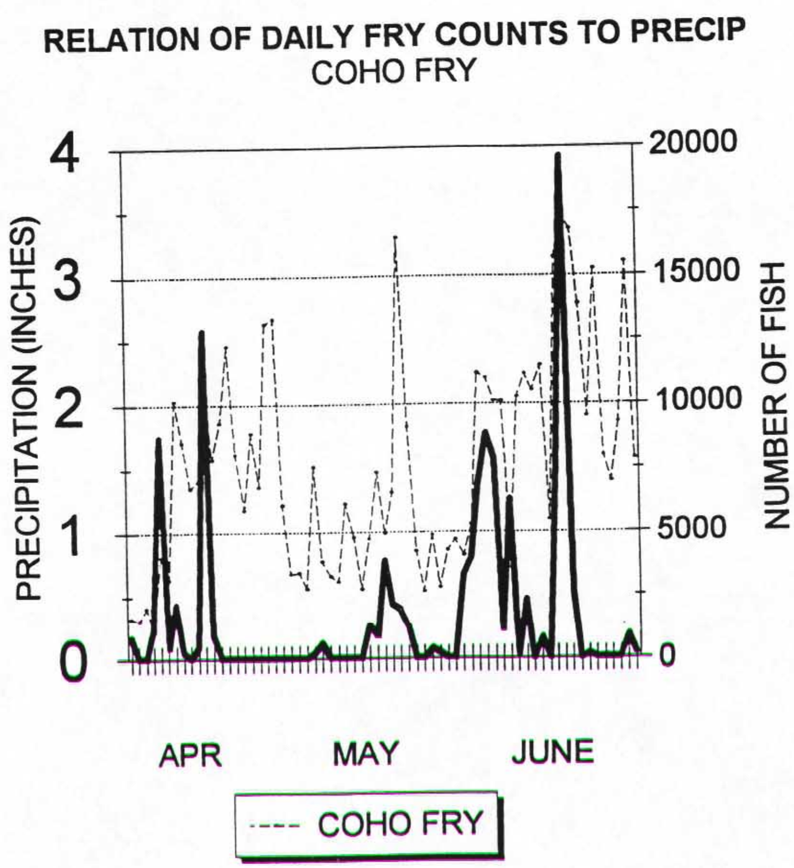

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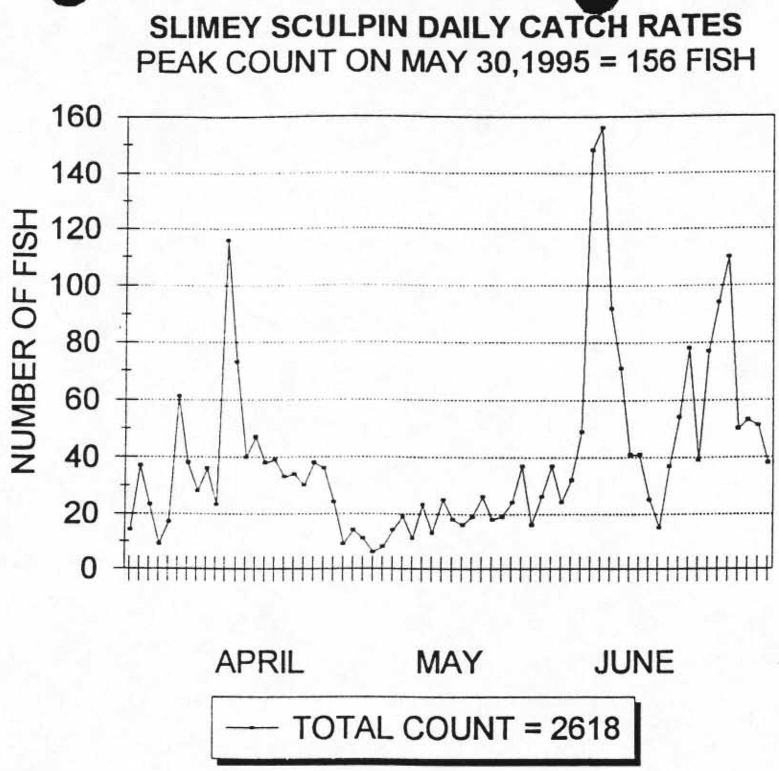

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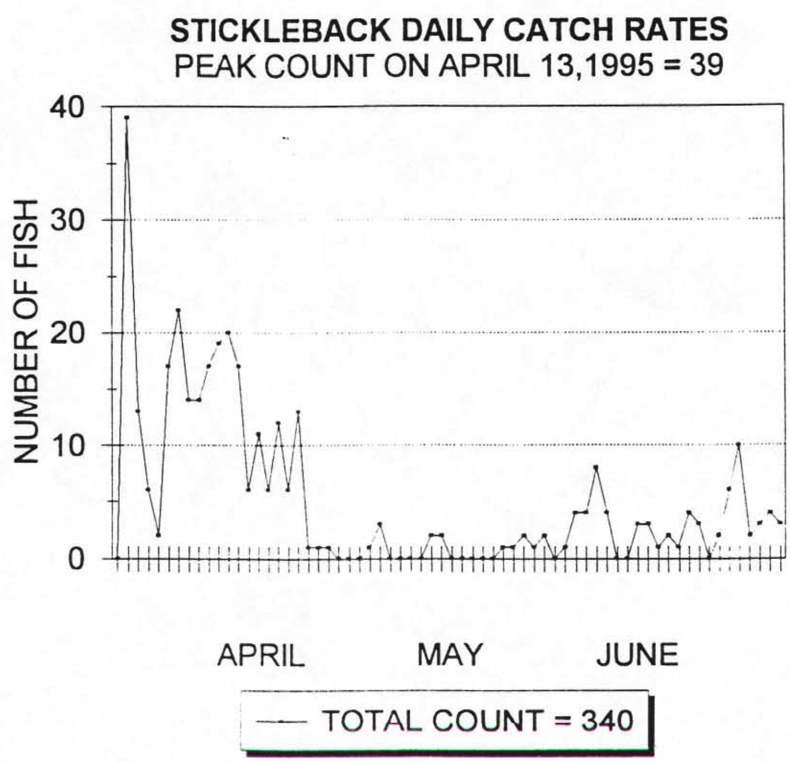

Figure 24.

Acknowledgments

Thanks to the City & Borough of Yakutat Salmon Enhancement Board, the Alaska Department of Fish & Game, the U.S. Geological Survey, and the Ophir Creek Advisory Group for their interest and participation in the Ophir Creek restoration project. Special thanks to C. Swanson, R. Sensmeier, and V. Johnson of the City of Yakutat for their help with the smolt traps.

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STATE OF ALASKA
DEPARTMENT OF FISH AND GAME
P.O. Box 25526
JUNEAU, ALASKA 99802-5526

Permit No. SF-95-020

Expires 12/31/95

FISH RESOURCE PERMIT

(SCIENTIFIC COLLECTIONS)

This permit authorizes Vince L. Harke, USDA Forest Service
person, agency or organization

of P.O. Box 327, Yakutat, AK 99869 to conduct the following
address

activities from April 1, 1995 to December 31, 1995 in accordance with AS 16.05.930.

Capture and release fish from streams and lakes in the Yakutat area.

Purpose: To sample for the presence of salmon and char in Yakutat area lakes and streams; to determine the coho fry yield from a section of Airport stream #182-80-10100-2005-3012; and to determine the salmonid yield from Ophir Creek.

Location: Streams, lakes, and ponds in the Yakutat area, including those mentioned in the statement of purpose above.

Species Collected: The following species may be captured:

coho salmon (Oncorhynchus kisutch):	juveniles	no limit
Dolly Varden (Salvelinus malma):	juveniles	no limit
cutthroat trout (Oncorhynchus clarki):	juveniles	no limit
rainbow trout (Oncorhynchus mykiss):	juveniles	no limit

Method of Capture: Fish may be captured with baited minnow trap and fyke net traps. Please see contingencies on the back of this page.

Final Disposition: All fish captured must be returned unharmed at the capture site.

-continued on back page-

REPORT DUE February 1, 1996. The report shall include species; numbers; dates and locations of collection and disposition; sex, age and breeding condition; lengths and weights of fish; other information as required.

GENERAL CONDITIONS, EXCEPTIONS AND RESTRICTIONS

1. This permit must be carried by person(s) specified during approved activities who shall show it on request to persons authorized to enforce Alaska's fish and game laws. This permit is nontransferable and will be revoked or renewal denied by the Commissioner of Fish and Game if the permittee violates any of its conditions, exceptions or restrictions. No redelegation of authority may be allowed under this permit unless specifically noted.

2. No specimens taken under authority hereof may be sold or bartered. All specimens must be deposited in a public museum or a public scientific or educational institution unless otherwise stated herein. Subpermittees shall not retain possession of live animals or other specimens.

3. The permittee shall keep records of all activities conducted under authority of this permit, available for inspection at all reasonable hours upon request of any authorized state enforcement officer.

4. Permits will not be renewed until detailed reports, as specified above, have been received by the department.

5. UNLESS SPECIFICALLY STATED HEREIN, THIS PERMIT DOES NOT AUTHORIZE the exportation of specimens or the taking of specimens in areas otherwise closed to hunting and fishing; without appropriate licenses required by state regulations; during closed seasons; or in any manner, by any means, at any time not permitted by those regulations.

Mark Schwan — Division of Sport Fish

Carl Burton — Commissioner

2/12/95 — Date

Authorized Personnel: The following personnel may participate in collecting activities under terms of this permit:

Vince L. Harke	Dorin Walter
Russell Perry	Talli Leach

Contingencies: 1) Robert Johnson, Sport Fish biologist in Yakutat, and Alan Burkholder, Commercial Fish Biologist in Yakutat must be notified prior to the initiation of any collecting. 2) Bait eggs used in minnow traps must be treated prior to use with an approved disinfectant. 3) If hook and line gear is used, individuals must possess a valid Alaska sport fishing license. 4) A report of all collecting activities must be submitted to Mark Schwan, Sport Fish Biologist, Juneau, within 30 days after the expiration of this permit. A copy of collection activities should also be forwarded to Mr. Ed Weiss, Habitat Division, ADFG 333 Raspberry Rd., Anchorage, AK 99518.

cc: Rob Bentz, Sport Fish, Douglas
Robert Johnson, Sport Fish, Yakutat
Allen Burkholder, CFMD, Yakutat
Lana Shea, Habitat, Douglas
FW Protection, Juneau

United States Department of Agriculture | Forest Service | Alaska Region, Tongass National Forest | Yakutat Ranger District, P.O. Box 327, Yakutat, Alaska 99689, (907) 784-3359

Reply To: 2600

Date: December 5, 1995

Ed Weiss
Habitat Division
Alaska Dept. of Fish & Game
333 Raspberry Road,
Anchorage, AK 99518

Dear Ed,

As defined by the conditions of the ADF&G Scientific Permit No. SF-95-020, I have enclosed reports listing the dates, locations, and numbers of fish captured by Forest Service personnel during 1995 on the Yakutat Ranger District.

In summary I supervised the operation of two fyke-net smolt traps last year. Both traps were installed on Ophir Creek (ADF&G #182-80-10100-2005-0010-3022) One trap was placed on main Ophir Creek, and the second trap was placed in East Ophir Creek, a major tributary stream of Ophir Creek. The traps were used to collect baseline information as part of a monitoring effort for a watershed restoration project. These traps were maintained for 65 days from April 12 -June 16, 1995. All fish captured were released live back into Ophir Creek. The results from this smolt monitoring study are documented in the enclosed report titled Downstream Migration of Juvenile Salmonids in Ophir Creek, 1995.

I also supervised a mark-recapture study to estimate coho abundance in Summit Lake (ADF&G# #182-80-10100-2005-0010. Summit Lake is provides rearing habitat for coho originating from Ophir Creek. The results of this mark-recapture study are documented in the enclosed report titled Summer Coho Rearing Estimates for Summit Lake.

I have also enclosed an ADF&G Nomination Form for Waters Important to Anadromous Fish to document the East Fork of Ophir Creek as anadromous fish habitat.

If you have any questions about our 1995 activities, please call me at our district office here in Yakutat.

Sincerely,

Vince L. Harke

Vince L. Harke
Biological Technician

Copies Sent To:
Mark Schwan, ADF&G, Sport Fish, Juneau

Enclosures